SOVIET CRUDE OIL PRODUCTION

Some Statistics

Crosfield
CHEMICALS

JOSEPH CROSFIELD & SONS LIMITED · WARRINGTON · ENGLAND

SOVIET CRUDE OIL PRODUCTION

Some Statistics

Joseph Crosfield & Sons, Limited,
Warrington.
1963

This publication has a simple aim : to set out in tabular form without comment such statistical data as we have been able to collect on postwar Soviet crude oil production, processing and internal trade.

We have excluded much information which lost significance when reduced to tabular form and have generally excluded index figures which are not related to known quantities. Data on foreign trade have been excluded since they are so comprehensive as to warrant special treatment: data on refining has been given where available, but it is lamentably scarce.

Finally, no attempt has been made to describe the background of the oil industry. Abundant data exist on its geology and geography on prospecting methods, equipment and techniques, but even a cursory survey would have greatly delayed this publication.

G.W. Hemy.

Tons are, of course, metric tons.

Roubles are either old roubles current until the end of 1960, (£1. = 11·20 old roubles). or new, from 1961 on, (£1. = 2·52 new roubles). In case of doubt we have tried to specify which rouble is used.

C O N T E N T S

Section		Page
A.	Deposits and Exploration	1
B.	Drilling	10
C.	Production of Crude	30
D.	Production Methods	35
E.	Productivity	38
F.	Capital Investment	41
G.	Equipment	50
H.	Labour	51
J.	Costs and Prices	59
K.	Raw Materials and Customers	63
L.	Consumption	68
M.	Transport	74
Major Sources.		80

SECTION A

Table A.1. Crude Oil Deposits

Index 1946 = 100

1940	
1950	164•0
1951	197•7
1952	333•0
1953	371•6
1954	423•3
1955	477•6
1956	510•0
1957	556•0
1958	
1959	
1960	
1961	
1962	
1965 (Plan)	

Source 5. No further details given

Table A.2. Crude Oil Deposits by Regions

U.S.S.R. = 100%

	Urals/Volga	Azerbaidzhan	Other
1946	30•3	42•1	27•6
1950	52•9	28•0	19•1
1951	60•2	24•7	15•1
1952	75•8	14•8	9•4
1953	77•7	13•5	8•8
1954	79•8	11•7	8•5
1955	81•1	10•7	8•2
1956	80•7	10•8	8•5
1957			
1958			
1959			
1960			
1961			
1962			
1965 (Plan)			

Source 5.

Table A.3. Cost of Discovery of Oil and Gas Deposits.

These include the costs of geological investigation, structural drilling, geophysical work and the drilling of the first bore holes.

Costs vary widely : the following are given as typical of the mid 1950's.

	Roubles 000 (old Roubles)
High yield wells	
Shkapov	1,200
Strel'nyi Ovrag	860
Romashkin	2,050
Aznakaev	1,800
Kipyachee	550
Gyurgyany Mora	4,500
Zhiloi Island	2,100
Kamni oilfields	3,850
Medium yield wells	
Borovsk	1,400
Berezovsk	1,050
Kartashevsk	585
Kokhan	600
Cheremshan	1,750
Low yield wells	
Kopei Kubovsk	755
Kamyshev	630
Chernovsk	500
Kazan-Bulaksk	1,250

Structural investigations are the largest item in the cost and they have tended to increase. In 1950 it cost on average Roubles 200,000 to establish the structure of a single area by geophysical means, and in 1955 Roubles 350,000. Regional variations were very great.

Cost of establishing a single structure
1950 - 1954

Roubles 000

Volga-Urals	150
Central Asia	900
Kzakhstan	200
Siberia	850
Ukraine	90
Far East	550

Commercial drilling speeds for deep exploratory bores have remained static and total drilling costs have consequently increased with increases in depth.

	Cost of drilling one metre of a deep exploratory well	Total cost of drilling an average deep exploratory well
	Roubles	000 Roubles
1951	97•5	138•5
1955	121•7	212•0
1959	112•5	198•0

Source 9.

Table A.4. Exploration Period

	From beginning of search Years	From beginning of exploratory drilling Years
U.S.S.R. average	4-5	
Tataria	10	3•5
Bashkiria	7	1•8
Kuibyshev	9½	2•5
Krasnodar Kray	4	2•5
Azerbaidzhan	10	3•5

Source 9.

Table A.5. Comparative cost of establishing deposits

1946 - 1960

Formation	Share of Capital Investment % of total	Share of new deposits established % of total	Capital cost of establishing 1 ton of deposit % of Cainozoic
Cainozoic	42•0	13•8	100
Mesozoic	13•1	3•2	136
Palaeozoic,	44•9	83•0	18
of which			
Permian	5•2	1•5	112
Carboniferous	12•7	18•6	22•8
Devonian	27•0	62•9	15•6

Source 9.

Table A.6. Methods of Exploration

	1940	1950	1960
Geological Roubles million	3•1	6•8	22•0
Geophysical "	3•3	17•6	88•0
Number of parties	77	286	1057
of which seismological	23	118	639
Seismic stations	18	118	575
Electrical "	-	5	210
Gravimetric "	4	75	334
Structural Drilling 000 metres	188	1088	3334
Deep " "	531	2127	4023
Exploratory Bores	359	1074	1647

Source 9

Table A.7. Cost of Geological Exploration and Deep Exploratory Drilling

million Roubles at price of 1st July, 1955.

1946	546•4
1947	822•2
1948	1277•7
1949	1783•1
1950	2413•6
1951	2724•7
1952	3007•3
1953	3535•8
1954	3358•7
1955	3450•5
1956	3358•3

The above figures are, of course, in old Roubles (10 old Roubles = 1 new)

Source 5.

Table A.8. Crude Oil Resources as a percentage of all primary fuel & energy resources

1960

	%		%
U.S.S.R.	27·5	Lithuania	-
R.S.F.S.R.	32·6	Latvia	
North West	2·5	Estonia	
Centre	10·0	Transcaucasus	67·3
Volga-Vyatsk	32·0	Georgia	43·3
Central Chernozem	0·0	Azerbaidzhan	76·7
Volga	79·9	Armenia	
N.Caucasus	33·0	Central Asia	48·0
Urals	48·5	Uzbekistan	26·4
W.Siberia	16·8	Kirghizia	17·0
E.Siberia	6·7	Tadzhikistan	1·9
Far East	16·5	Turkmenia	92·9
Ukraine	3·1	Kazakhstan	10·1
Donets-Pridneprovsk	0·2	Belorussia	0·0
South West	8·9	Moldavia	0·0
South	35·7		
West			

Source 10

Table B.1. Drilling for Oil and Gas

000 metres

	Total	Exploitation	Exploration	
1940	1,947	1,416	531	
1950	4,283	2,156	2,127	
1951	4,707	2,332	2,375	
1952	4,905	2,626	2,279	
1953	5,362	2,880	2,482	
1954	4,940	2,673	2,267	of which
1955	5,012	2,770	2,242	for Oil
1956	5,090	2,775	2,315	1,972
1957	6,161	3,293	2,868	2,290
1958	6,887	3,518	3,369	2,648
1959	7,148	3,386	3,762	2,831
1960	7,715	3,692	4,023	2,929
1961	8,363	3,830	4,533	
1965 (plan)	16,042	5,930	10,112	

Sources 4, 9 and 10

Table B.2. Total Drilling by Region

% of U.S.S.R

	Caucasus	Urals and Volga	Central Asia & Kazakhstan	Other
1940	81·2	11·4	7·2	0·2
1950	56·0	21·1	12·6	10·3
1960	25·1	48·3	11·1	15·5

Source 9.

Table B.3. Exploratory Drilling by Region

% of U.S.S.R.

	Caucasus	Urals and Volga	Central Asia	Far East	South	Other
1940	67·0	12·0	12·0	1·0	2·0	6·0
1950	44·8	27·6	10·6	2·5	7·9	6·6
1955	28·8	44·5	12·5	3·0	5·8	5·4
1960	23·6	35·0	12·0	1·0	8·5	19·9

Source 9.

Table B.4. Distribution of Wells

%

	1940	1950	1960	No.of Wells 1st Jan.1960
U.S.S.R.	100•0	100•0	100•0	38,500
R.S.F.S.R.	26•0	28•0	41•0	15,952
Krasnodar	4•5			
Chechen Ingush	12•5			
Azerbaidzhan	50•5	49•0	39•0	15,005
Ukraine	14•0	8•6	4•4	1,767
Kazakhstan	6•0	8•0	6•4	2,462
Uzbekistan	2•5	4•0	3•4	1,290
Turkmenia	0•7	2•1	3•6	1,300
Kirghizia)			0•9	334
Georgia)	0•3	0•3	0•6	206
Other)			0•7	C.200

There were about 20,000 wells in 1940, 3,500 in 1960.

Source 9.

Table B.5. Exploratory Drilling by Republic, etc.

% of U.S.S.R.

	1940	1950	1955
Azerbaidzhan	48•2	21•2	7•3
Groznyi	9•7	8•1	6•6
Dagestan	1•3	4•1	1•2
Krasnodar	5•5	10•3	10•4
Turkmenia	1•0	3•9	4•3
Saratov & Volgograd	-	6•7	4•9
Ukraine	3•1	5•3	5•2
Georgia	3•8	1•5	0•3
Bashkiria	7•7	7•5	14•3
Tataria	0•3	5•2	2•4
Perm	1•3	1•7	3•2
Kuibyshev	2•7	5•9	6•9
Kazakhstan	7•0	3•5	3•0
Central Asia	1•4	3•1	2•3
Far East	1•2	2•6	2•9
Other	5•8	9•4	24•8

Source 6

Table B.6. Average Depth of Wells

metres

U.S.S.R.

	Exploitation	Exploration
1940	990	1,108
1950	1,146	1,349
1951		
1952		
1953		
1954		
1955	1,454	1,748
1956	1,441	1,790
1957	1,478	1,832
1958	1,607	1,857
1959	1,592	1,870

Sources 4 and 9.

Range of Well Depths - 1954

Depth	% of total
Up to 750 metres	14•8
751 - 1500 "	34•8
1501 - 2500	41•5
2501 and more	8•9

Source 6.

Table B.7. Average Depth of Wells

metres

	1950	1959
Turkmenia	1,614	1,574
Kazakhstan	434	483
Ukraine	761	1,730
Uzbekistan	861	1,080
Krasnodar Kray	1,029	1,678
Stavropol Kray		1,433
Sakhalin	514	665

Table B.8. Average Depth of Completed Wells

metres

	*	1951	1955	1956	1957	1958	1959
Bashkiria	A	1,542	1,620	1,619	1,622	1,816	
	B		1,797	1,727	1,705	1,789	
Tataria	A	1,764	1,768	1,778	1,783	1,773	
	B		1,792	1,784	1,767	1,722	
Kuibyshev	A	799	1,387	1,376	1,313	1,725	
	B		1,189	1,326	1,840	1,807	
Perm	A		1,510	1,444	1,455	1,529	
	B		1,833	1,852	1,739	1,810	
Saratov	A	1,044	1,835	1,703	1,798	1,952	
	B		1,968	1,993	2,079	1,873	
Volgograd	A		1,091	1,097	1,233	1,246	
	B		1,701	1,537	1,645	1,889	
Orenburg	A		1,768	1,733	1,743	1,779	
	B		2,284	2,042	1,900	1,106	
Azerbaidzhan	A	1,281	1,443	1,273	1,412	1,424	1,514
	B		2,097	2,310	2,179	2,619	2,863
Chechen Ingush	A	1,314	1,633	1,139	1,395	1,220	
	B		2,246	2,290	1,983	2,646	
Krasnodar	A	1,235	2,050	1,896	1,746	1,703	
	B		2,060	2,184	2,165	2,241	
Dagestan	A		1,700	-	1,394	1,404	
	B		1,693	1,944	1,975	2,212	
Kazakhstan	A		531	607	516	388	483
	B		1,207	1,306	1,477	1,166	1,113
Ukraine	A		1,292	1,680	1,749	1,731	1,730
	B		1,892	1,740	1,900	1,941	2,126
Turkmenia	A		1,307	1,416	1,241	1,543	1,517
	B		2,066	2,204	2,071	2,357	2,139
Uzbek	A		782	909	587	881	1,080
	B		1,212	1,506	1,586	1,373	1,220
Kirghizia	A		1,080	1,003	1,638	2,293	
	B		1,804	2,027	1,943	2,284	

* A = Exploitation B = Exploration

Sources 4, 6 and 9

Table B.9. Main details of Typical Wells in various geological formations

	Devonian	Carboniferous	Mesozoic	Tertiary
Depth metres	1600-1900	1000-1200	2500-3000	1500-1800
Daily yield per well tons	40-60	20-30	50-60	30-40
Quality of Crude	low sulphur	sulphur	light	light
Capital cost per additional ton of crude. Roubles	18	28	38	80
Cost of recovery per ton % of industry average	50	70	170	260

Source 9

Table B.10. Drilling Speeds (metres per rig month)

	*	1940	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961
U.S.S.R.	A	412	629	652	675	711	749	893	940	1082	1084	996	993	966
	B	233	209	205	197	216	230	306	342	401	417	419	401	397
Azerbaidzhan	A	498	828	822	805	876	896	983	1045	973	992	837		
	B	315	209	191	203	222	152	223	299	316	288	300	291	
Groznyl	A	852	706	653	679	658	783	751	739	1050	757			
	B	293	314	278	245	306	290	268	269	333	315			
Krasnodar	A	785	1039	946	1245	1422	1166	1377	1997	2795	2881	2514		
	B	403	368	383	433	538	531	808	713	879	800		658	
Bashkiria	A	389	445	571	665	796	888	1015	863	964	1011	1184		
	B	253	241	259	277	284	381	454	544	609	678		686	
Tatarla	A	-	419	470	418	530	585	826	848	1206	1438	1582		
	B	59	238	228	320	300	412	805	466	579	803		1089	
Kuibyshev	A	203	458	488	473	588	650	793	896	1103	905			
	B	152	221	231	211	224	258	335	274	342	322		314	
Volgograd	A	-	-	228	277	380	529	952	868	785	621			
	B	-	109	125	83	271	612	681	375	493	465			
Far East	A	453	453	392	459	621	757	1013	982	931	1109	1280		
	B	376	191	192	176	220	258	287	344	311	390		469	
Komi, A.S.S.R.	A							628	773	1188	832			
	B							301	452	293	277			
R.S.F.S.R.	A							903	938	1162	1170			
	B							351	362	440	461			
Turkmenia	A							(624	988	977	908	856		
	B		500					(250	273	292	327	317	258	
Kazakhstan	A		374					(663	966	1160	1698	1312		
	B							(210	197	262	297	211	324	
Ukraine	A							(623	451	488	492	476		
	B		226					(195	295	305	360	368	284	
Uzbekistan	A							(1536	1115	1337	1177	841		
	B		591					(337	436	506	580	565		
Kirghizia	A							778	900	773	593			
	B							382	445	603	461			
Perm	A							1020	907	774	776	1113		
	B							375	464	604	324		612	
Orenburg	A							989	717	876	779			
	B							304	296	334	324			
Saratov	A							568	685	614	613			
	B							292	347	483	538			
Stavropol Kray	A							474	852	633	409)	784		
	B							290	221	300	357)			
Dagestan	A							-	-	515	397			
	B							211	236	250	293			

Sources 4,6,7,8,9 & 10.

1965 (Plan) A.1767 B.780.

* A = Exploitation
B = Exploration

Table B.11. Mechanical Drilling Speed

(Metres/hour)

	Exploitation	Exploration
1940	2•08	1•26
1950	3•92	1•68
1951	4•37	1•83
1952	5•15	2•18
1953	6•19	2•57
1954	7•23	3•16
1955	9•22	4•52
1956	9•92	5•20

Regional Figures

	1940	1950	1959
Bashkiria	1•2		12•1
Tataria	-		14•8
Perm	0•93		12•0
Turkmenia		3•6	6•9
Kazakhstan		3•0	14•4
Ukraine		1•1	4•4
Uzbekistan		3•0	7•8
Krasnodar Kray		7•0	15•4
Stavropol Kray		-	11•5
Sakhalin		2•9	14•2

Sources 5, 7, & 9

Table B.12. Cost of Drilling

Roubles per metre

(in prices of 1st July,1955)

	Exploitation	Exploration
1950	456	1,182
1951	453	1,139
1952	455	1,243
1953	468	1,256
1954	503	1,375
1955	485	1,366 +
1956	459	1,110
1957	456	1,069
1958	465	1,083
1959		
1960		
1961		
1962		
1963 (plan)	359	820

+ or 1,240 (Source 4)

Sources 4 and 5

Table B.13. Cost of Drilling by Republic

Roubles/metre

	*	1952	1953	1954	1955	1956	1957	1958
R.S.F.S.R.	A				496	468	456	460
	B				1167	1026	1029	1060
Azerbaidzhan	A	371	378	401	395	360	397	392
	B				2009	1416	1319	1213
Turkmenia	A	648	632	643	622	576	536	620
	B				1630	1322	1304	1436
Kazakhstan	A	571	598	654	502	413	401	377
	B				982	1279	1350	1325
Ukraine	A				500	575	668	748
	B				1275	1192	1014	1020
Uzbekistan	A				315	357	426	555
	B				777	859	955	843
Kirghizia	A				824	604	674	781
	B				1381	1004	967	1158

Sources 4 & 6

* A = Exploitation
  B = Exploration

Table B.14. Cost of Drilling - R.S.F.S.R.

Roubles/metre

	*	1951	1952	1953	1954	1955	1956	1957	1958
Kuibyshev	A	615	604	442	498	509	465	452	532
	B					1021	1148	1144	1222
Perm	A	570	850	544	663	486	472	477	548
	B					917	805	653	681
Saratov	A		846	813	896	627	567	701	758
	B					1127	1304	954	954
Volgograd	A			807	659	563	536	591	818
	B					690	753	824	915
Orenburg	A					398	452	479	542
	B					1041	963	1055	1068
Chechen Ingush	A		388	360	410	443	405	365	531
	B					1237	1246	1259	1286
Krasnodar	A		297	275	340	327	275	234	225
	B					581	595	593	624
Dagestan	A					-	-	813	984
	B					2059	1511	1554	1244
Sakhalin	A					645	594	642	688
	B					2040	1923	2130	2197
Bashkiria	A	566	523	486	468	474	526	595	536
	B	1042	929	950	910	860	784	741	740
Tataria	A	579	725	654	699	557	537	445	415
	B	1075	941	1039	986	695	661	794	716

Sources 4, 5, and 6.

* A = Exploitational
B = Explorational

Table B.15. Drilling Rigs in Operation

	Total	Exploitational	Explorational
1940	488	280	208
1950	1,080	280	800
1951	1,220		
1952	1,240		
1953	1,300		
1954	1,120		
1955	870	258	610
1960	1,033	283	750

Sources 5 & 9

Table B.16. Amount Drilled per Working Rig Month
(metres)

	All	Exploitational	Explorational
1950		636	209
1951	321	652	205
1952	333	675	197
1953	344	711	216
1954	358	749	230
1955	483	893	306
1956	537	943	337

Source 5.

Table B.17 Labour Productivity in Drilling

	Metres Drilled	No. of Workers	Drilled per Worker m
1950	4282•6	72,953	58•7
1951	4707•2	77,492	60•7
1952	4905•0	82,849	59•2
1953	5361•9	86,646	61•9
1954	4940•2	81,860	60•3
1955	5012•3	74,006	67•7
1956			70•0
1957			79•8
1958			80•7

Sources 4 & 5.

By republic - 1959

	Metres drilled per worker
R.S.F.S.R.	76
Azerbaidzhan	113
Turkmenia	80
Ukraine	64
Kazakhstan	45
Uzbekistan	79

Source 9.

Table B.18. Use of Calendar Time in Oil Drilling

%

U.S.S.R

	Drilling Time								
	Total (1)	Drilling (2)	of which Cutting (3)	Lining (4)	Auxiliary (5)	Repairs (6)	Replacement of damage (7)	Work due to geological difficulties (8)	Other (9)
U.S.S.R.									
1940	66·1	42·0	29·2	11·0	13·1	6·4	6·9	5·3	15·3
1950	58·0	31·4	18·6	6·4	20·2	7·6	10·7	5·6	18·1
1951	57·3	29·9	17·0	6·0	21·4	8·0	10·7	5·8	18·2
1952	54·0	26·7	14·4	5·7	21·6	7·6	12·1	6·2	20·1
1953	53·4	25·4	12·8	5·7	22·3	7·3	13·6	5·1	20·6
1954	53·6	24·4	11·3	5·3	23·9	6·7	13·0	5·5	21·2
1955	57·9	26·5	10·6	5·4	26·0	6·8	11·1	6·1	18·1
1956	57·4		10·4			7·0	9·4	6·8	19·4
1957	67·4								
1958	68·6	34·5	14·2	8·2	25·8	6·0	7·0	6·7	11·7
Azerbaidzhan									
1940	71·7	44·1	32·0	12·7	14·9	4·1	7·9	4·3	12·0
1950	59·5	29·8	17·8	6·9	22·8	6·0	9·3	5·9	19·3
1951	56·7	27·2	15·6	6·0	23·5	5·1	10·1	8·5	19·6
1952	55·9	25·2	14·2	5·9	24·8	4·1	10·6	8·7	20·7
1953	60·4	26·6	14·9	5·9	27·9	4·4	13·4	4·4	17·4
1954	57·3	24·7	13·1	4·7	27·9	4·5	13·8	4·5	19·9
1955	63·3	27·4	13·4	4·9	31·0	4·6	11·8	3·9	16·4
Grognyi									
1940	58·0	36·6	21·1	10·3	11·1	7·9	7·7	6·4	20·0
1950	64·3	35·1	19·6	5·3	23·9	6·9	10·1	5·7	13·0
1951	61·4	32·3	14·6	4·7	24·4	7·2	12·0	3·8	15·6
1952	59·3	30·5	12·6	5·4	23·4	8·2	13·6	4·2	14·7
1953	58·0	28·5	12·0	5·5	24·0	7·4	17·0	2·5	15·1
1954	60·3	28·6	10·6	5·1	26·6	6·2	13·9	3·6	16·0
1955	63·3	31·6	9·7	3·7	28·0	7·0	10·9	2·8	16·0

Table B.18 - continued

	Drilling Time					Repairs	Replacement of damage	Work due to geological difficulties	Other
	Total	Drilling	of which Cutting	Lining	Auxiliary				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Krasnodar									
1940	66·6	32·6	23·0	18·0	16·0	4·6	5·3	3·2	20·3
1950	59·9	25·7	16·5	9·1	25·1	7·4	11·4	5·0	16·3
1951	61·9	27·4	20·9	8·8	25·7	8·2	12·3	4·4	13·2
1952	61·9	27·9	16·9	9·3	24·7	7·7	11·0	6·0	13·4
1953	62·1	28·3	16·7	10·4	23·4	8·0	11·5	6·6	11·8
1954	63·2	27·4	15·4	8·6	27·2	7·5	10·2	4·9	14·2
1955	63·0	29·0	15·8	8·5	28·5	6·3	9·9	3·0	14·8
Bashkiria									
1940	74·6	59·6	42·3	5·7	9·0	7·8	3·1	2·0	12·5
1950	66·8	39·6	24·6	6·2	21·0	7·0	4·7	6·5	15·0
1951	69·6	40·4	22·9	4·9	24·3	8·1	5·5	4·3	12·5
1952	66·5	36·3	19·0	5·2	25·0	8·2	7·5	4·2	13·6
1953	59·7	29·4	12·4	6·8	23·5	7·6	8·9	5·5	11·3
1954	60·6	29·8	12·3	7·1	23·7	7·1	7·5	9·1	15·7
1955	61·4	29·1	11·3	6·3	25·4	7·7	6·5	9·9	14·5
Tataria									
1940	60·7	38·1	21·3	4·8	17·8	8·9	9·5	6·0	14·9
1950	60·9	35·2	17·4	6·9	18·8	11·5	7·2	4·2	16·2
1951	52·9	29·1	10·7	5·1	18·7	10·6	8·1	5·0	23·4
1952	50·5	25·3	7·3	5·8	19·4	6·4	13·2	7·1	22·8
1953	54·6	25·1	7·0	6·6	22·9	5·4	9·1	7·7	23·2
1954	61·4	31·6	8·4	6·1	23·7	5·2	8·2	7·9	17·3
1955									

Table B.18 - continued

	Drilling Time					Repairs	Replacement of damage	Work due to geological difficulties	Other
	Total	Drilling	of which Cutting	Lining	Auxiliary				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Kuibyshev									
1940	63·5	45·1	31·4	5·7	12·7	6·7	6·5	5·5	17·8
1950	64·4	34·6	20·7	6·7	23·1	9·0	8·1	5·0	13·5
1951	65·9	32·7	19·3	7·4	25·8	8·9	7·2	6·2	11·8
1952	56·5	26·9	15·0	6·5	23·1	7·5	9·8	7·5	18·7
1953	56·8	25·9	12·6	5·8	25·1	7·0	10·5	5·0	20·7
1954	55·0	23·1	9·5	4·8	27·1	6·4	10·9	7·8	19·9
1955	62·1	26·7	9·1	6·0	29·4	5·6	8·9	7·6	15·8
Volgograd									
1940									
1950	23·1	15·4	10·3	1·7	6·0	3·8	19·4	39·4	14·3
1951	40·4	23·2	15·2	5·1	12·1	8·8	19·0	10·1	21·7
1952	44·9	21·7	15·2	8·1	15·1	7·0	8·1	12·9	27·1
1953	47·4	20·8	12·0	8·7	17·9	6·3	6·3	12·4	27·6
1954	54·1	25·9	13·3	9·8	18·4	7·7	6·3	15·3	16·6
1955	62·8	29·8	13·3	11·4	21·6	9·0	5·9	10·5	11·8
Far East									
1940	70·5	37·7	20·5	19·3	13·5	9·5	5·5	0·7	13·8
1950	56·3	30·8	16·1	7·0	18·5	10·1	7·2	3·2	23·2
1951	44·3	19·8	11·2	7·6	16·9	8·0	13·3	4·6	29·8
1952	36·9	16·5	8·7	6·9	13·5	7·9	6·8	2·4	46·0
1953	42·6	18·2	9·1	7·3	17·1	7·9	13·4	2·6	33·5
1954	49·1	22·8	10·1	6·5	19·8	7·9	10·8	2·2	30·0
1955	54·4	24·8	9·9	5·4	24·2	8·4	9·2	4·8	23·2

Source 8 (1940-1955), Other years 4, 5, & 6.

Table B.19. Incidents involving damage to drill or equipment

	All Drilling		Exploitational		Explorational	
	No.	Per 1000 m drilled	No.	Per 1000 m drilled	No.	Per 1000 m drilled
1950	6021	1·5	1621	0·76	4400	2·2
1951	6462	1·4	1747	0·75	4715	2·15
1952	6305	1·3	1589	0·61	4716	2·1
1953	8013	1·5	2075	0·72	5938	2·5
1954	5119	1·1	1415	0·53	4004	1·8
1955	3404	0·67	998	0·36	2406	1·08
1956	2635	0·52	858	0·31	1777	0·77

Source 5.

Table B.20. Life of Drilling Bits

metres

	All	of which Cutter Bits
1940	4·2	
1945	47·6	36·2
1950	44·1	
1955	30·3	29·5

Source 6.

Table B.21. Turbine Drilling as % of total drilling

	*	1940	1945	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960
U.S.S.R.	T	2·4	6·7	23·0	29·7	40·4	53·6	66·9	83·1	84·7				
	A	3·3	8·3	27·5	34·8	43·4	58·0	69·2	86·3	87·6			82·7	91·7
	B	0·2	4·6	18·4	24·7	36·9	48·5	64·2	79·1	81·2				
Azerbaidzhan	T	3·1	4·8	20·7	27·7	31·6	35·4	44·2	59·1					
	A	4·0	5·9	23·6	31·2	34·.	40·1	48·5	61·1					
	B	0·3	3·3	14·6	19·0	21·9	23·1	27·6	53·3					
Groznyi	T	-	2·5	28·9	41·7	53·7	64·6	75·8	87·3					
	A	-	2·7	28·1	41·2	48·8	63·9	79·1	90·1					
	B	-	2·2	29·7	42·2	58·7	65·3	72·5	84·4					
Krasnodar	T	1·9	-	-	3·0	33·5	58·4	57·7	72·0					
	A	2·5	-	-	4·9	46·5	74·2	63·1	78·8					
	B	-	-	-	0·6	16·6	36·6	48·7	62·1					
Bashkiria	T	9·6	2·6	63·0	74·4	79·3	88·3	90·5	91·8					
	A	13·6	5·6	89·0	96·1	92·8	89·9	87·8	88·9					
	B	-	-	37·3	57·3	67·9	86·4	93·1	95·2					
Tataria	T	-		57·3	81·9	99·5)								
	A	-		68·0	92·1	99·8)	100·0	-	-					
	B	-		50·7	70·4	99·0)								
Kuibyshev	T	-	3·4	34·4	38·2	50·0	63·6	91·5	99·0					
	A	-	3·4	37·8	39·1	50·4	61·1	98·3	100·0					
	B	-	3·5	31·5	37·3	49·7	66·4	83·8	97·5					
Volgograd	T	-	-	-	19·8	45·7	88·6	98·1	98·5					
	A	-	-	-	27·4	45·6	88·4	98·5	98·5					
	B	-	-	-	-	47·1	91·6	96·3	98·5					
Far East	T	-	1·8	34·1	32·7	54·2	59·4	73·3	89·1					
	A	-	2·6	26·2	27·5	54·4	47·7	76·8	98·2					
	B	-	-	38·8	35·9	54·0	68·0	70·8	78·6					

* T = Total, A = Exploitational, B = Explorational

Sources 5, 7, 8 & 9.

Table C.1. U.S.S.R.

Production of Crude Oil

(000 tons)

1940	31,121
1950	37,878
1951	42,253
1952	47,311
1953	52,777
1954	59,281
1955	70,793
1956	83,806
1957	98,346
1958	113,216
1959	129,557
1960	147,859
1961	166,068
1962	186,000
1965 (Plan)	230,000 - 240,000

Sources 4, 8, 10.

Table C.2. Production of Crude Oil by Republic

000 tons

	R.S.F.S.R.	UKRAINE	UZBEKISTAN	KAZAKHSTAN	GEORGIA	AZERBAIDZHAN	KIRGHIZIA	TADZHIKISTAN	TURKMENIA
1940	7,039	353	119	697	41	22,231	24	30	587
1950	18,231	293	1,342	1,059	43	14,822	47	20	2,021
1951	21,800	287	1,166	1,270	n.a.	15,300	71	19	2,368
1952	26,100	284	1,020	1,362	n.a.	15,700	142	18	2,651
1953	31,386	334	966	406	n.a.	15,700	137	18	2,743
1954	38,200	415	994	1,384	n.a.	15,200	110	16	2,862
1955	49,263	531	996	1,397	43	15,305	115	17	3,126
1956	61,311	762	1,029	1,427	39	15,586	199	21	3,430
1957	98,346	981	1,115	1,438	34	15,977	356	20	3,795
1958	113,216	1,236	1,297	1,511	35	16,497	490	18	4,154
1959	129,557	1,627	1,465	1,544	35	17,076	424	17	4,577
1960	147,859	2,159	1,603	1,610	34	17,833	464	17	5,278
1961	166,068	2,837	1,709	1,700	31	18,704	422	15	6,110
1962	187,000	6,000	3,000	2,000		22,000			7,500
1965 (Plan)	197,940								

Sources 4, 5, 6, 8, 10.

Table C.3. Eastern U.S.S.R.
(Urals, W.Siberia, E.Siberia, Far East, Central Asia & Kazakhstan)

Crude Oil Production

	Million Tons	% of U.S.S.R.
1940	3·6	11·5
1958	31·0	27·4
1959	35·1	27·1
1960	39·5	26·7
1961	44·8	27·0

Source 10

Table C.4. Number of Wells giving Oil or Gas as a percentage of all wells drilled

%

	U.S.S.R.	BASHKIRIA
1951	52	36.9
1952	46	30.9
1953	48	43.4
1954	50.3	52.0
1955	50.5	57.0
1956	55.6	54.6

Source 5.

Table C.5. Production of Crude Oil by Geological Formation

Formation	% of total crude production
Cainozoic	27.0
Mesozoic	2.9
Palaeozoic	70.1
Permian	2.6
Carboniferous	19.0
Devonian	48.5

Source 9.

Table C.6. Production per Well per month

Tons

U.S.S.R

	All Wells	New Wells	Old Wells
1940	240		
1950	168	462 (?)	153
1951		488	153
1952		531	154
1953		580	160
1954		696	170
1955	215	870	191
1956		923	224
1957			
1958			
1959			
1960	340	1,089	

Sources 5, 8, 9.

Table C.7. Production per Well per month

Tons

by area

	1940	1950	1955	1959	1960
U.S.S.R.	240	168(462)	215(870)		340(1989)
R.S.F.S.R.		293(632)		650	654(1278)
Chechen Ingush	145				
Krasnodar	445		225(802)		
Groznyi			97(372)		
Bashkiria			804(1588)	952	
Tataria			1817(1627)	1516	
Kuibyshev			497(1302)	980	
Volgograd			1323(1201)	1057	
Far East			56(185)		
Azerbaidzhan	280	139(314)	104(343)	115	116(643)
Kazakhstan	60	57(423)		59	59(154)
Turkmenia		527(1168)		349	349(876)
Ukraine		13(117)		100	99(1793)
Uzbekistan	50	160(290)			106(394)

Figures in brackets are for new wells.

Sources 8 and 9

Table C.8. New Wells

	Number of new wells drilled.	Oil obtained from new wells m.tons	Increase in oil production over previous year. m.tons
1940	1,553	5·5	0·9
1950	2,163	5·2	4·4
1951	2,282	5·7	4·4
1952	2,412	6·7	5·1
1953	2,272	6·9	5·4
1954	2,247	7·9	6·5
1955	2,202	10·4	11·5
1956	1,976	9·6	12·9

Increase in crude production for each new well

1936-40	827 tons	
1951-55	2,880	
1956-59	6,550	
1959	4,200 tons	of which
		Tataria 9,600
		Volgograd 9,000
		Bashkiria 6,600
		Kuibyshev 13,000

Sources 5 and 9

Table D.1. Methods of getting Crude

	Gusher	Compressor	Pump	Other
1940	23·3	37·2	38·4	1·1
1950	32·5	21·1	44·7	1·7
1951	37·4	17·8	44·1	0·7
1952	42·0	15·2	42·0	0·8
1953	46·1	12·0	40·5	1·4
1954	51·0	9·1	38·8	1·2
1955	58·3	6·5	34·0	1·2
1956	64·5	5·0	29·6	0·9
1957	69·0	3·9	26·5	0·6
1958	70·4	3·4	25·6	0·6
1959	72·7	2·6	24·2	0·5
1960	73·7	2·3	23·5	0·5
1961	74·0	2·1	23·5	0·4

Sources 5, 8, 9 & 10.

Table D.2. Gusher Production as a percentage of total crude production

	1940	1950	1955	1959	1960
Azerbaidzhan	24•2	5•2	18•0		38•2
Groznyi	10•1	42•9	10•9		
Dagestan	49•9	29•8	0•7		
Krasnodar	33•2	12•3	53•0		82•0
Turkmenia	71•1	58•2	64•7		58•0
Bashkiria	9•7	84•8	68•3	71•0	72•0
Tataria		89•7	97•6	98•5	93•0
Perm		17•2	60•9		72•0
Kuibyshev	1•6	67•0	69•9	74•0	81•6
Kazakhstan	2•9	24•4	32•4		
Ukraine		3•0	48•0		89•0
Volgograd		99•2	94•9		94•9
Far East	59•8		23•0		

Sources 5, 8 & 9.

Table D.3. Treatment to increase oil pressure

	Injection of water 000m^3/day	Hydraulic Rupture of seams No. of treatments	Sulphuric Acid Treatment No.of operations
1950	8•9		
1953	44•5	2	
1954		282	1,600
1955	81•6	878	2,240
1956	103•7	1,901	2,520
1957	116•0	2,905	
1958	141•6	2,713	
1959	164•7	2,262	
1960	189•4	2,707	
1961	201•5	2,493	

Injection of water : The above figures from the statistical Year Books are about one third of those given in earlier sources.

Hydraulic Rupture of Seams : In 1958 and 1959 the process was carried out about 5000 times :

R.S.F.S.R.	1800
Azerbaidzhan	1900
Turkmenia	150
Ukraine	350
Kazakhstan	100

In 1959 an extra 274,000 tons were so produced.
Extra production per well :

R.S.F.S.R.	276 tons
Turkmenia	191 tons
Kazakhstan	148 tons

Sulphuric Acid Treatment : figures given in one source only, they may be much too high.
Various figures for the extra crude obtained are given, but their accuracy is extremely questionable.

Sources 5, 9 & 10. (figures in 4 and 7 are suspect)

Table E.1. Labour Productivity
Crude Production

1940 = 100

1950	82
1951	
1952	
1953	99
1954	
1955	131
1956	154
1957	178
1958	198
1959	222
1960	248
1961	277

Source 10.

Table E.2. Crude Output per Worker
U.S.S.R.

Tons/Year

	Natural Units
1950	682·0
1955	1082·0
1956	1266·0
1957	1471·0
1958	1637·0

Source 4.

Table E.3. Labour Productivity

Production of Crude per worker per year (tons)

	1950	1955	1959	1960
U.S.S.R.	710	1,076		2,087
R.S.F.S.R.	1,047	1,774	3,118	3,572
Azerbaidzhan	548	528		636
Turkmenia	1,779	1,873		647
Kazakhstan	401	538		579
Ukraine	78	166		638
Uzbekistan	390	705		1,237
Volga-Urals		3,200-3,800		
Tataria			5,372	
Bashkiria			3,146	
Kuibyshev			4,540	
Volgograd			5,346	

Source 9

Table E.4. Ukraine

Productivity and Cost of Crude Oil

	Crude Production per worker Tons	Cost of Crude per ton Roubles
1945	56•6	223•30
1946	54•0	260•82
1947	56•6	282•18
1948	63•3	258•27
1949	69•2	256•61
1950	71•2	237•17
1951	89•3	217•72
1952	89•6	209•97
1953	105•2	178•17
1954	130•0	147•11
1955	177•4	122•06
1956	281•5	91•12
1957	360	

Old Roubles

Source 6.

Table F.1. Capital Investment

Roubles m. at comparable prices

	All Industry	Oil & Gas Industry		Uncompleted construction work at end of year
		Roubles m.	% of all	
1918 - 1928 +	643	24	3·7	
1st 5-year Plan	2,897	207	7·1	
2nd 5-year Plan	6,377	477	7·5	
3rd 5-year Plan ø	6,228	461	7·4	
1 Jly 41-1 Jan.'46	7,908	624	7·9	
4th 5-year Plan	17,164	1,974	11·5	
5th 5-year Plan	34,385	4,739	13·8	
1956	9,428	957	10·2	
1957	9,919	1,104	11·1	1061
1958	11,208	1,357	12·1	1025
1959	12,909	1,553	12·0	1157
1960	14,289	1,728	12·1	1400
1961	14,899	1,899	12·8	1630
Total 1918-1961	148,254	17,104	11·5	
1959-1965	93,600-96,000	17,000-17,300	18·0	
of which 1959-61	42,100	5,200	12·3	
remaining	51,500-54,000	11,800-12,000	22·5	

+ Exoluding last quarter 1928

ø 3½ years only.

The roubles above are New Roubles.

Source 10.

Table F.2. Capital Investment in Oil Industry by region

% of U.S.S.R.

Year	Urals/ Volga	North Caucasus	Far East	Uzbekistan Kazakhstan Turkmenia	Azerbaidzhan	Other
1938-1940	13•6	15•9	3•5	8•9	33•8	24•3
1941-1945	19•8	13•9	5•5	7•1	25•8	27•9
1946-1950	19•5	10•5	3•1	6•5	20•7	39•7
1951	32•4	15•3	3•6	10•6	20•4	17•7
1952	36•0	12•7	3•1	8•5	19•9	19•6
1953	43•3	9•5	2•7	7•7	15•6	21•2
1954	43•0	8•8	3•0	7•2	14•9	23•1
1955	46•5	11•1	3•0	7•9	9•0	22•5
1951-1955	40•5	11•3	3•1	8•3	15•8	21•0

Source 6.

Table F.3. Investment in the Oil Industry at a percentage of total capital investment

	1946	1950	1960
Azerbaidzhan	43•6	39•9	39•1
Chechen Ingush	6•8	6•4	5•0
Krasnodar	3•7	6•8	4•2
Bashkiria	6•0	8•2	9•8
Tataria		1•9	11•0
Kuibyshev	3•5	4•8	5•0
Perm	2•4	2•7	1•4
Orenburg	0•9	1•2	0•6
Saratov		0•8	0•9
Volgograd		0•1	0•9
Uzbekistan	2•4	3•7	2•3
Turkmenia	3•5	6•0	4•8
Kazakhstan	5•0	4•0	2•7
Ukraine	12•9	6•5	2•3
Sakhalin	8•0	5•6	3•8

Source 9.

Table F.4. Capital Investment in the Oil Industry by purpose

Million old Roubles

at prices of 1st July, 1955

	1951	1952	1953	1954	1955	1956	1940 %	1946 %	1950 %	1955 %	1960 %
∮											
Drilling - Exploitational	1035	1205	1385	1368	1510	1229	27	16	17	19	17
Explorational	2600	2665	3190	3012	3079	2121	16	22	30	38	47
Drilling Equipment	781	972	1014	813	541	352	6	16	9	7	2
Well Equipment	537	549	538	486	472	345	33*	30*	25*	27*	25*
Building - for oil production	35	47	40	54	50	33					
- for pipeline	79	71	91	154	196	146					
Secondary methods of exploitation	-	-	87	96	182	135					
Derrick building	-	-	101	86	59	60					
Equipment for production & exploitation of gas	119	122	181	161	186	127					
Transport	209	263	257	200	79	94					
Roads & foundations	180	226	182	89	128	145					
Energy	112	108	128	142	182	136					
House building	354	334	435	362	381	428					
Water and piping	152	135	128	102	88	120					
Mechanical workshops, pipe bases, engineering	39	36	39	45	42	35					
Other	705	820	992	929	1011	793					

* Other Industrial Equipment.

∮ Later figures for exploitational drilling, million new Roubles

1957 - 100
1958 - 160
1959 - 160
1960 - 170

Table F.5. Capital Expenditure in the Oil Industry by purpose

%

	1940	1945	1950	1955
Drilling Exploitation	25	10	18	18
Exploration	15	14	31	38
Drilling Equipment	7	8	9	7
Productive Construction	35	45	22	9
Geological Prospecting	8	3	2	
House Building	2	3	3	5
Other Works	8	17	15	13

Source 6.

Table F.6. Oil Industry - Fixed Capital (at prices of 1st January 1961)

%

	1940	1960
Buildings	11	9•6
Installations	54	51•8
Power Equipment		3•8
Transmission Equipment	11	11•4
Production Equipment	4	18•9
Transport	3	3•3
Instruments, Stocks	2•5	1•2

Source 9

Table F.7. Cost of Geological Exploration

Old Roubles million at prices of 1st July, 1955

	Geological Search	Explorational Drilling	Total
1946	169•6	376•8	546•4
1950	543•2	1870•4	2413•6
1951	588•5	2136•2	2724•7
1952	850•7	2156•6	3007•3
1953	1005•5	2530•3	3535•8
1954	1030•8	2327•9	3358•7
1955	1091•5	2359•0	3450•5

Table F.8. Capital Investment in Drilling

Roubles million at prices of 1st July, 1955

		1951	1952	1953	1954	1955
Bashkiria	T	266	293	400	453	469
	B	188	191	237	296	282
Tataria	T	98	157	271	298	372
	B	61	101	87	66	45
Kuibyshev	T	178	170	194	229	274
	B	113	109	124	149	160
Krasnodar	T	216	234	224	184	250
	B	141	150	140	101	136
Chechin Ingush	T	202	195	224	221	220
	B	142	137	162	158	153
Azerbaidzhan	T	754	856	929	643	514
	B	413	426	538	319	328
Turkmenia	T	175	182	210	224	243
	B	92	114	131	142	159

T = Total
B = Exploration

Source 5.

Table F.9. Capital Investment in Crude Production

Actual expenditure at prices of 1st July, 1955

Roubles million

	Bashkiria	Tataria	Kuibyshev	Krasnodar	Turkmenia	Ministry of Crude Oil Production U.S.S.R.
1946	135·2	9·1	97·9	115·3	56·4	360·1
1950	404·2	195·0	249·0	283·8	294·6	1498·9
1951	451·4	273·2	300·0	370·2	338·2	1678·0
1952	557·7	461·2	332·1	374·3	329·7	1961·3
1953	834·3	826·1	361·3	387·3	374·9	1870·5
1954	810·4	803·6	437·8	338·1	347·5	1326·9
1955	903·1	943·6	516·6	420·9	365·9	991·9
1956	967·1	977·6	499·1	379·9	329·2	835·5

Source 5

Table F.10. Capital Investment in Crude Oil Production

% of U.S.S.R.

	Caucasus	Urals-Volga	Kazakhstan Central Asia	Far East	Other
1940	63	14	11	3	9
1946-50	51	26	15	?	
1950	45	20	12	6	17
1951-55	43	35	11	?	
1955	26	41	11	5	17
1956-60	26	50	12	?	
1960	23	46	12	5	14

Fixed Capital employed at January 1st, 1960

million new Roubles

All Industry	80
Crude Oil Production	3·8
Oil Processing	1·5

Source 9

Table F.11. Capital Investment per extra ton of crude

Roubles

	1946-50	1951-55	1956-59
U.S.S.R.	57	53	32
Urals-Volga	30	23	20 ø
Caucasus	75	740	74 ø
Central Asia) Kazakhstan)	64	161	78 ø
Bashkiria	25	21	24
Tataria	28	19	19
Perm	156	97	22
Kuibyshev	20	39	31
Volgograd		12	27
Azerbaidzhan		978	133
Turkmenia		92	75
Ukraine		116	15

ø 1956-1958

Source 9

Table G.1. Production of Oil Industry Equipment

	All Equipment 000 tons	Deep Pumps 000	Turbo Drills No.
1940	15•5	31•9	90
1950	47•9	65•7	978
1953	121•3		
1955	48•8	79•7	2589
1956	49•3	79•9	2772
1957	60•1	86•2	3489
1958	70•9	88•0	4213
1959	76•5	95•3	4898
1960	93•0	81•8	6222
1961	106•8	80•3	6752

Source 10.

Table G.2. Deep Pumps Installed

	No.	Crude produced 000 tons
1952	51	175
1953	126	970
1954	247	2300
1955	357	3000
1956	453	4169
1960	about 1000	10,000

Source 7 & 9

Table H.1. Workers Employed

	Oil Industry (end year)		Oil Industry (? Yearly Average)		
	000	% of all industry	Total 000	Crude Production 000	Drilling 000
1940	45	4•4	50•4	27•8	22•6
1950		5•9	124•0	52•7	71•3 *
1951					77•5
1952					82•8
1953		6•6			86•6
1954					81•9
1955	122	7•1	139•5	65•5	74•0
1956	125	7•1			
1957	128	7•3			
1958	136				
1959	140				
1960	145		162•0*	71•0	91•0 "
1961	154				

Figures marked with an asterisk are approximate

Sources 9 & 10

Table H.2. Workers Employed by Region

000

Region	1950			1955			1960		
	Total	Crude Production	Drilling	Total	Crude Production	Drilling	Total	Crude Production	Drilling
R.S.F.S.R.			39•7	81•6	27•5	54•1	98•3	34•4	63•9
Azerbaidzhan			15•0	35•7	28•9	6•8	34•1	26•8	7•3
Turkmenia			3•5	4•6	1•7	2•9	5•6	1•8	3•8
Kazakhstan			3•0	5•4	2•6	2•8	5•8	2•7	3•2
Ukraine			4•8	7•0	3•0	4•0	10•4	3•0	7•4
Uzbekistan			3•2			1•6			3•0
Kirghizia			0•9	5•2	1•8	0•9	7•7	2•3	1•0
Other			1•3*			0•9*			1•4*

Figures marked with an asterisk
are approximate

Source 9.

Table H.3. Service of Workers

Years of Service	1949	1950	1953
Crude Oil Production			
Up to 1	20•8	20•2	17•9
1 - 3	31•2	29•9	25•0
3 - 5	19•1	17•9	19•0
5 - 8	12•5	15•3	14•9
8 - 15	12•0	12•8	23•3
15 - 40	4•2	3•8	-
Over 40	0•2	0•1	-
Drilling			
Up to 1	36•1	31•3	25•3
1 - 3	36•0	38•9	33•1
3 - 5	13•0	15•0	20•0
5 - 8	6•2	7•1	12•1
8 - 15	6•5	5•9	9•4
15 - 40	2•2	1•8	-
Over 40	-	0•01	-

Source 6

Table H.4. Age of Workers - 1953

Drilling

	%
Up to 19 years	8•6
20 - 25 "	30•6
26 - 35 "	28•0
36 - 49	25•0
50 - 54	4•1
55 - 59	2•3
60 & over	1•4

Source 6.

Table H.5. Education of Workers - 1953

Drilling

%

	Up to Class V.	Classes V & Vl	Classes Vl to Vlll	Classes lX & X	Technical Middle School
Drillers	45•3	25•3	23•7	5•5	0•2
Driller's Assistant	38•0	32•1	21•5	7•9	0•5
Surface Workers	37•4	32•2	21•4	9•0	
Workers	43•2	28•5	22•3	7•0	
Motormen	30•5	42•7	24•4	2•4	

Source 6.

Table H.6. Distribution of Workers & Employees by length of Service 1st April 1958

By total length of service %

	(1) All Industry	(2) Oil Production	(3) Oil Processing
Up to 10 years	59•6	55•8	59•3
10 - 15 "	19•1	21•6	20•2
15 - 20 "	9•9	11•1	10•7
20 - 25 "	5•9	6•2	5•3
25 - 30 "	3•5	3•3	2•9
30 - 35 "	1•2	1•3	1•0
Over 35 "	0•8	0•7	0•6

By continuous length of service %

	1953			1957		
	(1)	(2)	(3)	(1)	(2)	(3)
Up to 1 year	21	21	18	19	14	13
1 - 3 "	29	28	28	25	21	22
3 - 5	18	17	17	16	15	18
5 - 10 "	20	22	20	23	27	27
Over 10 "	12	12	17	17	23	20

Source 10

Table H.7 Shift Workers

1st August, 1959

%

	All Industry	Crude Production	Oil Processing
I Shift	64•5	67•0	64•8
II "	23•3	17•8	16•4
III "	11•4	14•6	14•9
IV "	0•8	0•6	3•9
Shift Coefft.*			
Entire Plant	1•55	1•49	1•54
Main Plant	1•62	1•62	1•87

* i.e. the ratio $\frac{\text{All Workers}}{\text{Workers on I Shift}}$

Source 10.

Table H.8. Adult Workers & Employees
length of Holiday
%
1st April, 1958

	All Industry	Crude Production	Oil Processing
12 Working days	31•3	11•4	9•1
15 " "	20•8	19•6	9•7
18 " "	10•3	14•6	11•0
21 " "	5•7	24•8	16•0
24 " "	19•0	14•8	23•9
27 " "	9•2	9•4	28•7
Over 27 " "	3•7	5•4	1•6

Source 10

Table H.9. Average Length of Working Day

Hours

	All Industry	Crude Oil Production
1956	7·96	7·98
1959	7·70	7·94
1960	6·94	6·96

Source 10

Table H.10 Education of Workers

	Technical School pupils entering oil industry	Young Engineers entering oil industry
1946	860	752
1947	999	924
1948	1,872	1,600
1949	2,390	1,478
1950	3,476	1,353
1951	3,155	1,707
1952	2,825	2,355
1953	3,473	2,197
1954	4,115	2,515
1955	4,250	735
1956	5,035	3,016
1957	5,693	3,189

Source 7

Table H.11. Number of Specialists Employed

000
at 1st December

(a) Crude Oil Production

	Middle Education			Higher Education		
	1959	1960	1961	1959	1960	1961
Total	7•3	8•1	8•5	5•0	5•0	4•9
of which						
Engineers	6•3	6•8	7•1	4•5	4•4	4•3
Mining & Geology	4•0	4•2	4•2	3•7	3•6	3•6
Power, Radio, Comms.	0•5	0•7	0•7	0•2	0•2	0•2
Metallurgy & Engin.	0•9	1•1	1•2	0•3	0•3	0•3
Chemistry	0•2	0•2	0•2	0•1	0•1	0•1
Building	0•3	n.a.	n.a.	0•1	n.a.	n.a.

(b) Oil Processing

Total	10•2	11•1	11•7	4•7	4•9	5•0
of which						
Engineers	8•9	9•5	9•9	4•0	4•0	4•1
Mining & Geology	0•2	0•3	0•3	0•1	0•1	0•1
Power, Radio, etc.	1•0	1•1	1•1	0•3	0•3	0•3
Metallurgy, etc.	2•6	2•9	3•1	0•7	0•7	0•8
Chemistry	4•3	4•5	4•5	2•7	2•5	2•6
Building	0•3	n.a.	n.a.	0•1	n.a.	n.a.

Source 10.

Table J.1. Cost per ton of Oil & Casing Head Gas

1950 = 100

	1955	1958	1965 Plan
U.S.S.R.	78•8	58•8	45•7
R.S.F.S.R.	62•0	50•6	44•6
Azerbaidzhan	129•3	109•2	85•4
Turkmenia	116•7	108•1	88•2
Kazakhstan	85•2	84•1	83•7
Ukraine	51•5	23•4	12•1
Uzbekistan	156•1	131•4	92•7
Kirghizia	106•1	45•2	32•4
Georgia	67•3	78•7	97•2
Bashkiria	66•4	67•8	75•6
Perm	52•7	32•1	21•0
Orenburg	64•8	45•1	34•4
Tataria	46•3	42•8	43•3
Kuibyshev	82•4	54•8	41•6
Stalingrad	15•9	16•6	16•6
Saratov	39•3	45•7	47•1
Krasnodar	120•0	95•8	97•1
Chechen Ingush	155•3	151•1	91•8
Dagestan	188•6	219•0	145•6
Sakhalin	96•8	77•2	64•4

Other years U.S.S.R. 1956 - 70•1
1957 - 63•2

Source 4.

Table J.2 - Comparative Cost of Crude by Region

R.S.F.S.R. = 100

	1950	1955	1958
Azerbaidzhan	147•7	312•0	328•3
Ukraine	537•0	430•0	243•6
Turkmenia	117•6	218•1	252•3
Kazakhstan	248•0	336•3	413•3

Source 4.

U.S.S.R. 100 1958

European North	275	Urals	60
Volga	41	Far East	340
S.W.&.Donets Pridneprovsk	160	Kazakhstan	272
N.Caucasus	157	Central Asia	169
Transcaucasus	214		

Source 11

Average cost of crude oil.
European region (including Urals) Old Roubles 26•40,
Eastern region Roubles 69•40 per ton of conventional fuel.
Source 3.

Table J.3. Reduction in cost per rouble of Final Product

	All Industry	Crude Production	Oil Processing
1959	-1•6	-1•1	-1•9
1960	-1•8	-1•8	-3•0
1961	-0•9	-3•0	-4•1

Prices averaged with preceding year, expressed as a percentage reduction.

Source 10

Table J.4. Average cost of Boiler Mazut
(New roubles per ton of conventional fuel)
1958

U.S.S.R.	5•60
European North	8•70
Volga	2.20
S.W. and Donets Pridneprovsk	10.40
N.Caucasus	8•00
Transcaucasus	9•50
Urals	3•40
Sverdlovsk	3•19
Chelyabinsk	2•92
Far East	23•60
Kazakhstan	5•40
Central Asia	8•20
N.W.	6•90
W.	7•00
Centre	4•70
Central Chernozem	4•90
Volga-Vyatsk	3•60
W.Siberia	2•20
E.Siberia	5•40

Sources 3 & 11

Table J.5. Breakdown of Costs

Crude Oil Production

%

	1955	1957	1959	1961	1959-by method of production		
	Prices of corresponding year				Gusher	Compressor	Pump
Raw Materials		-					
Subsidiary Materials	8•7	8•0	8•4	7•6			
Fuel	2•2	1•7	1•8	1•6			
Energy	9•5	8•6	8•9	8•9	0•2	21•7	5•2
Depreciation	42•8	45•2	46•5	46•8	52•9*	42•0*	44•6*
Wages	23•5	24•6	22•5	23•0			
Social Insurance	1•9						
Other	11•4	11•9	11•9	12•1			

* of which well depreciation 46•2, 34•8, 40•2 respectively.

Other cost elements are given as follows:

	Gusher	Compressor	Pump
Wages of Production Personnel	8•3	10•2	11•7
U.G. repairs	-	6•3	21•1
Increasing seam yield	19•0	-	-
Interindustry oil transport	4•4	4•6	5•2
General industry costs	9•2	10•6	9•0
Other costs	6•0	4•6	3•2

Sources 9 and 10

Sources of Raw Materials and Customers of the Oil Industry

The following tables reproduce the appropriate lines and columns from an input/output table for the U.S.S.R. in 1959. These were published in the statistical year books for 1960 (the rouble figures) and 1961 (the worker-year figures). The tables, as published, are incomplete: inputs and outputs do not balance; foreign trade and military consumption are notable absentees; and no definitions are given. The figures are, however, interesting (particularly the 'worker year' concept) if only for the different method of conveying the information.

Roubles are new roubles.

Table K.1. Raw Materials & Supplies

Source	Crude Oil Production	Oil Processing
	Roubles million	Roubles million
Metallurgy	1•4	9•7
Coke Chemicals	-	6•8
Refractories	0	1•0
Crude Oil	1•8	739•7
Oil Products	9•2	315•8
Gas Products	0	1•3
Electricity and Heat Energy	45•7	128•1
Drilling and other Equipment	12•6	9•3
Tractors and Parts	1•6	0•1
Repair of Equipment	17•7	14•6
Basic Chemicals	1•9	39•3
Plastics and Synthetics	0	7•2
Organic Chemicals	0	8•0
Wood Chemicals	0	2•9
Building Materials	0•6	3•9
Sewn goods	3•3	4•8
Milk products	0•1	1•3
Other	8•1	90•7
Total	104•0	1,384•5

Industry	104•0	1,384•5
Transport	337•8	846•2
Trade		680•8
	441•8	2,911•5

New Roubles

Source 10

Table K.2. Labour used in materials supplied to the Oil Industry by other industries

(Worker years)

	Crude Production	Oil Processing
Metallurgy	146	1,025
Coke Chemical Products	-	220
Refractories	2	220
Crude Oil	163	66,344
Oil Processing	144	4,975
Electricity & Heat Energy	5,183	14,518
Electrical Equipment	109	75
Instruments	107	98
Testing Equipment	60	208
Repairs of Equipment	5,834	4,811
Drilling Equipment	2,633	1,947
Tractors	275	20
Basic Chemicals	162	3,383
Artificial Fibres, Synthetic Resins and Plastics	0	705
Organic Chemicals	1	1,025
Timber Products	136	74
Wood Working Products	137	130
Wood Chemicals	3	315
Building Materials	122	865
Sewn Goods	438	636
Other Industry	1,559	754
Total	17,212	102,356
Industry	17,212	102,356
Building	4	6
Agriculture	65	14
Transport	106,910	333,168
Trading Organisations, etc.	-	232,765
Total	124,191	668,309

Table K.3. Customers

Customer	Crude Oil Production Roubles Million	Oil Processing Roubles Million
Metallurgy	3·2	195·8
Coke Chemicals	-	1·6
Refractories	-	4·0
Coal	-	7·9
Crude Oil	1·8	9·2
Oil Processing	739·2	315·8
Gas Production	3·2	0·9
Peat	-	10·4
Oil Shale	-	1·2
Electricity & Heat Energy	31·3	214·2
Power Machinery	-	6·4
Electrical Machinery	-	17·9
Cables	-	5·1
Engineering	0·2	6·6
Instruments & Control Equipment	0	4·3
Heavy Equipment	0·1	17·5
Pumps, Compressors	0·4	7·2
Light & Food Industry Equipment	-	5·5
Lifting Equipment	0	3·0
Building Equipment	-	3·0
Building Materials	0	2·5
Transport Engineering	0	15·9
Cars & Parts	0	25·3
Tractors & Agricultural Machinery	0	14·3
Tyres	-	2·5
Sanitary Equipment	0·1	2·4
Other Metalware	0·1	8·3
Repair of Equipment	2·3	57·4
Abrasives	-	4·4
Coal Chemicals	-	1·5
Basic Chemicals	0·1	13·5
Aniline Dyestuffs	0	2·3
Artificial Fibres	0	2·0
Organic Chemicals	-	20·5
Paints & Varnishes	0·1	19·6
Resin - Asbestos	0	14·3
Other Chemicals	0·5	79·0
Carried forward	782·6	1,123·2

Table K.3. Customers (continued)

Customer	Crude Oil Production Roubles Million	Oil Processing Roubles Million
Brought forward	782·6	1,123·2
Wood & Timber	1·0	246·1
Woodworking	0·1	23·3
Furniture	0	4·0
Other wood industries	0	2·8
Paper	0·1	12·9
Wood Chemicals	-	3·7
Building Materials	6·9	141·5
Glass & Pottery	2·7	17·7
Textiles	0·2	20·2
Sewn Goods	-	1·1
Other Light Industry	0	11·4
Fish & products	0·1	57·8
Meat " "	0·1	3·1
Milk " "	0·4	12·3
Sugar	0·2	50·7
Milling, Baking, Confectionery	1·3	16·4
Other Food Industry	0·3	52·0
Other Industry	1·1	12·1
Total Industry	797·1	1,812·3
Crop Farming	-	1,021·7
Livestock Farming	-	29·9
Total Agriculture	-	1,051·6
Summary		
Industry	797·1	1,812·3
Building	9·5	357·0
Agriculture	-	1,051·7
Forestry	-	5·1
Transport & Communications	-	961·6
Trading Organisations & Communal Feeding	-	32·6
Other	-	3·5
	806·6	4,223·8

Table L.1. Consumption of Oil as a percentage of all Fuels

1913	14•2%
1940	8•3%
1950	7•1%
1955	9•2%
1958	10•2%
1965	14•6%

Production of Oil as a percentage of all Fuels and Hydroelectricity

1913	28•8%
1940	18•7%
1950	17•4%
1955	21•1%
1958	25•7%
1965	33•8%

Source 3

Table L.2. Consumption of Some Oil Products

1958 & 1965

User	Fuel	1958 Million Tons Actual	1958 Million Tons Conventional	1958 % of all Fuels	1965 Million Tons Actual	1965 Million Tons Conventional	1965 % of all Fuels
Electricity *	M	4·8	6·9	5·5	19·2	27·5	11·8
Railways	M	3·9	5·3	6·7	7·3	11·0	27·7
	D		1·7	2·1		8·6	21·7
Shipping	M	1·3	1·8	22·5	2·0	2·7	24·5
	D & M F		0·9	11·0		3·0	27·2
Civil Communal	M	326	468	0·8	845	1,215	1·4
	K	901	1,300	2·3	1,113	1,520	1·7
Agriculture	K	1,049	1,500	3·0	2,222	3,180	4·6

* In the Urals electricity accounts for 36·2% (1958),or 47·5% (1965) of all mazut used; in European Russia the figures are 47·8% (1958), or 37·5% (1965).

M = Mazut
D = Diesel Fuel
MF = Motor Fuel
K = Kerosine

Source 3.

Table L.3. Importance of Different Oil Products in Total Consumption

% of U.S.S.R.

	Motor Spirit	All Oils	Boiler Mazut	Oil Bitumen	Coke	Other	Total
1940	50•3	5•5	42•1	1•4	0•2	0•5	100•0
1950	60•1	5•1	30•3	2•9	0•3	1•3	100•0
1955	65•4	4•0	26•9	3•2	0•2	0•3	100•0

Source 6

Table L.4. Consumption of Boiler Mazut

Million tons

	1958	1965
All Industrial and Productive Uses	27•3	62•0
Metallurgy	5•1	3•6
Electricity	5•5	24•0
Marine & River Transport	1•6	2•7
Railways	3•9	7•3
Oil Industry	3•2	5•5
Cement	0•4	2•0
Sugar	0•6	2•8
Industrial Boilers	0•6	3•4
Other	6•4	10•7

Source 3

Table L.5. Usage of Mazut (Boiler & Marine) and Diesel Fuel.

1960 %

BY USE	Mazut	Diesel and Motor Fuel
To produce electricity	10·1	14·2
" " heat energy	27·9	1·0
mechanical energy	28·1	78·6
In industrial furnaces, etc.	31·9	3·8
Communal and Civil Needs	0·6	1·1
Other	1·4	1·3
BY USER		
Industry	69·1	19·8
Building	1·1	6·3
Agriculture	0·1	42·3
Transport	26·2	23·0
of which Railways	20·8	12·3
Household, Communal & Civil Needs	0·3	0·8
Other	3·2	7·8

Table L.6. Dispatch & Receipt of Crude Oil and Oil Products by Rail.

by Republic (000 tons)

		1940	1958	1959	1960	1961
R.S.F.S.R.	D	17,325	87,671	103,147	118,092	133,345
	R	19,151	70,253	80,180	91,647	98,784
Ukraine	D	5,385	8,872	9,341	10,533	11,462
	R	4,675	18,521	23,612	27,064	33,274
Belorussia	D	258	227	318	282	466
	R	777	2,684	3,354	3,555	4,284
Uzbekistan	D	331	1,634	1,759	1,902	1,994
	R	801	2,390	2,719	3,081	3,241
Kazakhstan	D	79	1,962	3,211	4,988	5,226
	R	741	5,739	6,716	7,431	7,551
Georgia	D	90	608	629	529	503
	R	2,259	2,925	3,696	4,552	4,885
Azerbaidzhan	D	4,069	6,889	8,292	9,736	11,054
	R	418	3,228	3,405	3,785	4,697
Lithuania	D	-	36	40	44	56
	R	-	711	900	2,496	3,435
Moldavia	D	3	55	71	80	83
	R	51	512	692	933	1,105
Latvia	D	-	32	37	56	53
	R	-	857	1,169	1,339	1,882
Kirghizia	D	1	4	3	2	3
	R	91	479	526	621	712
Tadzhikistan	D	20	9	8	5	8
	R	57	347	405	467	599
Armenia	D	4	10	9	12	9
	R	203	588	696	706	692
Turkmenistan	D	1,971	4,039	4,621	4,214	3,541
	R	572	2,194	2,578	2,007	1,179
Estonia	D	-	444	504	528	560
	R	-	809	858	928	1,089

D = Dispatched
R = Received

Table L.7. State and Co-operative Retail Trade in Kerosine

	Sales - New Roubles Million (contemporary prices)	End year stocks		Price Index 1940 = 100
		Roubles Million	Days' Sales	
1940	112	3½	9	100
1950	160	10¾	19	274
1951				
1952	167			213
1953				
1954				
1955	154	7½	15	99
1956	182	10	17	99
1957	216	13¾	21	99
1958	231	16	23	99
1959	216	19	31	99
1960	215	16	25	95
1961	203	17	30	95

Source 10

Table M.1. Movement of Oil Products

% of total

		1940	1950	1955
Water	Total	44·4	30·2	22·4
	Sea	29·0	16·6	13·9
	River	15·4	13·6	8·5
Rail		44·5	50·8	46·5
Pipelines	Total	11·1	19·0	31·1
	Crude	9·4	15·8	27·3
	Products	1·7	3·2	3·8

Source 7.

Table M.2. Length of Oil Pipelines

end year

000 km

1940	4·1
1950	5·4
1951	
1952	
1953	7·1
1954	
1955	10·4
1956	11·6
1957	13·2
1958	14·4
1959	16·7
1960	17·3
1961	20·5
1962	
1965 (Plan)	43·0

Source 10

Table M.5. Pipeline Transport

Crude Oil and Oil Products

	Million tons loaded	000 million ton/km carried	% of all freight transport
1940	7·9	3·8	0·8
1950	15·3	4·9	0·7
1951			
1952			
1953	29·4	7·6	0·8
1954			
1955	51·7	14·7	1·3
1956	65·3	20·5	1·6
1957	80·9	26·6	1·8
1958	94·9	33·8	2·1
1959	111·3	41·6	2·4
1960	129·9	51·2	2·7
1961	144·0	60·0	3·0
1962			
1965 Plan		185	7·4-7·2

Source 10

Table M.4. Cost of Transport of Oil by Pipeline - 1960

Diameter	mm	720	529	377
Capacity (one direction)	million tons T.p.a.	11	5	3
Cost - Roubles/ton	400 km	0•23	0•37	0•58
	1000 km	0•58	0•93	1•45
	1500 km	0•87	1•40	2•18
Capital Costs - per ton	400 km	0•20	3•20	4•72
	1000 km	5•00	8•00	11•80
	1500 km	7•50	12•00	17•70

New Roubles.

Source 11

Table M.5. Pipelines - end of 1956

Number	31 of which	25 for Crude	7,600 km
		6 " Products	3,900 km
	of which	8" diameter	1,100 km
		10" "	1,800 km
		12" "	2,800 km
		14" "	2,000 km
		20" "	3,800 km
		Total	11,500 km
Labour Force employed on pipelines		1956	8,900
		of which	6,000 workers
Productivity per Worker		million ton/km/year	
		1946 - 3·4	1956 - 10.

	Average Distance Pumped	Pumping losses kg/ton/km	Cost of Pumping Kopecks/ton/km (old Roubles)
1953		0·0205	
1954	257 km	0·0192	2·38
1955	284 km	0·0156	2·00
1956	330 km	0·0132	1·65 (& in newer lines 1·00)
1957	354 km		
1958 (Plan)	422 km		
1959 "	510 km		
1960 "	625 km		

Source 7

Table M.6. Crude Oil and Oil Products transported by Rail

	Loaded	Carried	Average Distance
	m.tons	000 m tariff/ton/ km	km
1940	29·5	36·4	1,234
1950	43·2	52·0	1,205
1951			
1952			
1953	62·3	76·9	1,235
1954	69·9	84·5	1,210
1955	77·6	101·6	1,309
1956	86·5	112·4	1,298
1957	99·0	131·2	1,326
1958	112·5	154·0	1,369
1959	132·0	182·1	1,380
1960	151·0	205·4	1,360
1961	168·4	230·6	1,369
1962			
1965 (Plan)			

Sources 3, 7 & 10.

Table M.7. Crude Oil and Oil Products carried by River

	Loaded - m.tons
1940	9·7
1955	14·4
1958	16·2
1959	17·7
1960	18·5
1961	20·5

Source 10

Table M.8. Efficiency of Tow Transport

(a) Ton/km carried per h.p. per day.

	Oil Products	Rafted Timber	Dry Goods
1940	686	977	203
1955	716	1,219	278
1958	655	1,211	308
1959	629	1,150	313
1960	583	1,166	325
1961	558	1,045	309

(b) By republic - Oil Products

	U.S.F.S.R.	Ukraine	Belorussia	Kazakhstan	Central Asia
1958	691	392		90	71
1959	658	385		104	73
1960	610	409		129	70
1961	583	393	67	128	86

Source 10

MAJOR SOURCES

1. V.A.Amiyan, V.M.Murav'ev. Teknicheskii progress v dobyche nefte Moscow 1962.

2. M.A.Yevseento. Neftyanaya promyshlennost'S.S.S.R. chestor pyatiletke Moscow 1957.

3. D.I.Maslakov Toplivayi balans S.S.S.R. Moscow 1960.

4. A.F.Zacyad'ko Toplivno -energetichestaya promyshlennost' S.S.S.R. Moscow 1959.

5. A.A.Keller Neftyanaya i gazovaya promyshlennost' S.S.S.R v poslevoennye gody Moscow 1958.

6. S.M.Lisichkin Ocherki Vazirtiya nefteclobyvaynshchei promyshlennosti' S.S.S.R. Moscow 1958

7. Neftyana promyshlennost' S.S.R. Moscow 1958

8. Promyshlennost' S.S.S.R. Statisticheskii Sbovnik Moscow 1957

9. M.M.Brenner Ekonomika neftyanaya promyshlennost' S.S.S.R. Moscow 1962

10. Narodnoe Khozyaistvo S.S.S.R.Statisticheskii Sbovnik, Moscow 1956
" " " v 1956 godu " " " 1957
v 1958 1959
v 1959 1960
v 1960 1961
v 1961 1962

11. A.E.Probst Razmeshchenie sotsialisticheskoi promyshlennosti Moscow 1962.
(An English digest of this book is an earlier study in this series)

This is one of a number of booklets dealing with industrial developments in Communist countries published by Joseph Crosfield & Sons, Limited of Warrington, as a service to British Industry and freely available to all who can make use of them. They are based exclusively on material published in the Soviet Union and other countries of the Communist block, most of it in the original language. Editorial comment is restricted to pointing out an occasional inconsistency or the clarification of a reference which might give difficulty to the reader. The object of the series is purely to report what these countries say about themselves without trying to support a particular thesis. In these circumstances we ought to make it clear that Joseph Crosfield & Sons, Limited do not thereby recommend any products or processes described nor warrant that their use is free from patent or other restriction.

We think that the reader who has arrived at this point will not take exception to our stating that in issuing these booklets Crosfield hope to do themselves an incidental service by making their name known in favourable circumstances to those companies who do not already know them. Crosfield manufacture sodium and potassium silicates, industrial detergents, silica gels, nickel and hydrocarbon cracking catalysts and a growing range of related fine particles which have solved many difficult problems of matting, flatting, antiblocking, caking, dosing, and so on. We do not pursue anyone merely because they have received one of these booklets, but we should be delighted to have you get in touch with us if you think we may be able to help you. We have another series of booklets - in our opinion equally useful and factual - which describe our products and their uses, as far as they have yet been discovered.

rinted by Joseph Crosfield & Sons, Limited, Warrington, England.

Table B.21. Turbine Drilling as % of total drilling

	*	1940	1945	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960
U.S.S.R.	T	2·4	6·7	23·0	29·7	40·4	53·6	66·9	83·1	84·7				
	A	3·3	8·3	27·5	34·8	43·4	58·0	69·2	86·3	87·6			82·7	91·7
	B	0·2	4·6	18·4	24·7	36·9	48·5	64·2	79·1	81·2				
Azerbaidzhan	T	3·1	4·8	20·7	27·7	31·6	35·4	44·2	59·1					
	A	4·0	5·9	23·6	31·2	34·.	40·1	48·5	61·1					
	B	0·3	3·3	14·6	19·0	21·9	23·1	27·6	53·3					
Groznyi	T	-	2·5	28·9	41·7	53·7	64·6	75·8	87·3					
	A	-	2·7	28·1	41·2	48·8	63·9	79·1	90·1					
	B	-	2·2	29·7	42·2	58·7	65·3	72·5	84·4					
Krasnodar	T	1·9	-	-	3·0	33·5	58·4	57·7	72·0					
	A	2·5	-	-	4·9	46·5	74·2	63·1	78·8					
	B	-	-	-	0·6	16·6	36·6	48·7	62·1					
Bashkiria	T	9·6	2·6	63·0	74·4	79·3	88·3	90·5	91·8					
	A	13·6	5·6	89·0	96·1	92·8	89·9	87·8	88·9					
	B	-	-	37·3	57·3	67·9	86·4	93·1	95·2					
Tataria	T	-		57·3	81·9	99·5)								
	A	-		68·0	92·1	99·8)	100·0							
	B	-		50·7	70·4	99·0)								
Kulbyshev	T	-	3·4	34·4	38·2	50·0	63·6	91·5	99·0					
	A	-	3·4	37·8	39·1	50·4	61·1	98·3	100·0					
	B	-	3·5	31·5	37·3	49·7	66·4	83·8	97·5					
Volgograd	T	-		-	19·8	45·7	88·6	98·1	98·5					
	A	-		-	27·4	45·6	88·4	98·5	98·5					
	B	-		-	-	47·1	91·6	96·3	98·5					
Far East	T	-	1·8	34·1	32·7	54·2	59·4	73·3	89·1					
	A	-	2·6	26·2	27·5	54·4	47·7	76·8	98·2					
	B	-	-	38·8	35·9	54·0	68·0	70·8	78·6					

* T = Total, A = Exploitational, B = Explorational

Sources 5, 7, 8 & 9.

Table C.1. U.S.S.R.

Production of Crude Oil

(000 tons)

1940	31,121
1950	37,878
1951	42,253
1952	47,311
1953	52,777
1954	59,281
1955	70,793
1956	83,806
1957	98,346
1958	113,216
1959	129,557
1960	147,859
1961	166,068
1962	186,000
1965 (Plan)	230,000 - 240,000

Sources 4, 8, 10.

Table C.2. Production of Crude Oil by Republic

000 tons

	R.S.F.S.R.	UKRAINE	UZBEKISTAN	KAZAKHSTAN	GEORGIA	AZERBAIDZHAN	KIRGHIZIA	TADZHIKISTAN	TURKMENIA
1940	7,039	353	119	697	41	22,231	24	30	587
1950	18,231	293	1,342	1,059	43	14,822	47	20	2,021
1951	21,800	287	1,166	1,270	n.a.	15,300	71	19	2,368
1952	26,100	284	1,020	1,362	n.a.	15,700	142	18	2,651
1953	31,386	334	966	406	n.a.	15,700	137	18	2,743
1954	38,200	415	994	1,384	n.a.	15,200	110	16	2,862
1955	49,263	531	996	1,397	43	15,305	115	17	3,126
1956	61,311	762	1,029	1,427	39	15,586	199	21	3,430
1957	98,346	981	1,115	1,438	34	15,977	356	20	3,795
1958	113,216	1,236	1,297	1,511	35	16,497	490	18	4,154
1959	129,557	1,627	1,465	1,544	35	17,076	424	17	4,577
1960	147,859	2,159	1,603	1,610	34	17,833	464	17	5,278
1961	166,068	2,837	1,709	1,700	31	18,704	422	15	6,110
1962	187,000	6,000	3,000	2,000		22,000			7,500
1965 (Plan)	197,940								

Sources 4, 5, 6, 8, 10.

Table C.3. Eastern U.S.S.R.
(Urals, W.Siberia, E.Siberia, Far East, Central Asia & Kazakhstan)

Crude Oil Production

	Million Tons	% of U.S.S.R.
1940	3·6	11·5
1958	31·0	27·4
1959	35·1	27·1
1960	39·5	26·7
1961	44·8	27·0

Source 10

Table C.4. Number of Wells giving Oil or Gas as a percentage of all wells drilled

%

	U.S.S.R.	BASHKIRIA
1951	52	36.9
1952	46	30.9
1953	48	43.4
1954	50.3	52.0
1955	50.5	57.0
1956	55.6	54.6

Source 5.

Table C.5. Production of Crude Oil by Geological Formation

Formation	% of total crude production	
Cainozoic	27.0	
Mesozoic	2.9	
Palaeozoic	70.1	
Permian		2.6
Carboniferous		19.0
Devonian		48.5

Source 9.

Table D.3. Treatment to increase oil pressure

	Injection of water $000m^3$/day	Hydraulic Rupture of seams No. of treatments	Sulphuric Acid Treatment No.of operations
1950	8•9		
1953	44•5	2	
1954		282	1,600
1955	81•6	878	2,240
1956	103•7	1,901	2,520
1957	116•0	2,905	
1958	141•6	2,713	
1959	164•7	2,262	
1960	189•4	2,707	
1961	201•5	2,493	

Injection of water : The above figures from the statistical Year Books are about one third of those given in earlier sources.

Hydraulic Rupture of Seams : In 1958 and 1959 the process was carried out about 5000 times :

R.S.F.S.R.	1800
Azerbaidzhan	1900
Turkmenia	150
Ukraine	350
Kazakhstan	100

In 1959 an extra 274,000 tons were so produced.
Extra production per well :

R.S.F.S.R.	276 tons
Turkmenia	191 tons
Kazakhstan	148 tons

Sulphuric Acid Treatment : figures given in one source only, they may be much too high.
Various figures for the extra crude obtained are given, but their accuracy is extremely questionable.

Sources 5, 9 & 10. (figures in 4 and 7 are suspect)

Table E.1. Labour Productivity
Crude Production

1940 100

1950	82
1951	
1952	
1953	99
1954	
1955	131
1956	154
1957	178
1958	198
1959	222
1960	248
1961	277

Source 10.

Table E.2. Crude Output per Worker
U.S.S.R.

Tons/Year

	Natural Units
1950	682·0
1955	1082·0
1956	1266·0
1957	1471·0
1958	1637·0

Source 4.

Table D.3. Treatment to increase oil pressure

	Injection of water 000m³/day	Hydraulic Rupture of seams No. of treatments	Sulphuric Acid Treatment No.of operations
1950	8•9		
1953	44•5	2	
1954		282	1,600
1955	81•6	878	2,240
1956	103•7	1,901	2,520
1957	116•0	2,905	
1958	141•6	2,713	
1959	164•7	2,262	
1960	189•4	2,707	
1961	201•5	2,493	

Injection of water : The above figures from the statistical Year Books are about one third of those given in earlier sources.

Hydraulic Rupture of Seams : In 1958 and 1959 the process was carried out about 5000 times :

R.S.F.S.R.	1800
Azerbaidzhan	1900
Turkmenia	150
Ukraine	350
Kazakhstan	100

In 1959 an extra 274,000 tons were so produced.
Extra production per well :

R.S.F.S.R.	276 tons
Turkmenia	191 tons
Kazakhstan	148 tons

Sulphuric Acid Treatment : figures given in one source only, they may be much too high.
Various figures for the extra crude obtained are given, but their accuracy is extremely questionable.

Sources 5, 9 & 10. (figures in 4 and 7 are suspect)

Table E.1. Labour Productivity
Crude Production

1940 = 100

1950	82
1951	
1952	
1953	99
1954	
1955	131
1956	154
1957	178
1958	198
1959	222
1960	248
1961	277

Source 10.

Table E.2. Crude Output per Worker
U.S.S.R.

Tons/Year

	Natural Units
1950	682·0
1955	1082·0
1956	1266·0
1957	1471·0
1958	1637·0

Source 4.

JOSEPH CROSFIELD & SONS LIMITED

Head Office and Works: Bank Quay, Warrington
Telephone: Warrington 31211 Telegrams: Crosfields, Warrington

London Office: Orchard House, Orchard Street, London, W.1
Telephone: HYDe Park 7871 Telegrams: Savonnier, London, W.1